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State of California—Health and Human Services Agency  
Department of Health Services



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GRAY DAVIS

Director

April 2, 2002

Mr. Donald E. Vanderkar  
Director, Environmental Restoration Programs  
Aerojet  
P.O. Box 13222  
Sacramento CA 95813-6000

Dear Mr. Vanderkar:

**CONDITIONAL ACCEPTANCE OF BIOLOGICAL TREATMENT (FLUIDIZED BED REACTORS) FOR THE REMOVAL OF PERCHLORATE DURING DRINKING WATER PRODUCTION**

The Water Treatment Committee (WTC) of the Drinking Water Program in the California Department of Health Services has reviewed the following documents submitted with your request to gain acceptance of biological treatment (fluidized bed reactors) as a means of removing perchlorate from source waters for distribution as part of the public water supply.

"Final Phase 2 Treatability Study Report Aerojet GET E/F Treatment Facility Sacramento, California," April 2001, prepared by Harding ESE, Denver, CO.

"Review of Phase 2 Treatability Study Aerojet Facility Rancho Cordova, California," July 2001, by Robert Clark, Ph.D., P.E.; Michael Kavanaugh, Ph.D., P.E.; Prof. Perry McCarty, Ph.D., P.E.; R. Rhodes Trussell, Ph.D., P.E.; Jerome B. Gilbert, P.E.

The WTC concurs with the recommendations and findings of the Aerojet Expert Panel (AEP). The Department finds that the biological process using a fluidized bed of granular activated carbon for perchlorate removal can be a stable means of removing or reducing perchlorate in source waters provided the perchlorate feed concentration, feed flow, and ethanol feed are carefully monitored and controlled. The system, when operated under stable flow and perchlorate concentration, can produce water that contains nondetectable levels of perchlorate. As with any treatment process, reducing contaminants to below a detectable concentration may not be the same as providing absolute removal of the contaminant. Nevertheless, the AEP is clear that they consider



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the biological process to be capable of perchlorate removal with several important caveats that have been incorporated into the conditions presented below.

Based on the findings of the AEP the WTC recommends conditional acceptance of biological treatment to remove or reduce perchlorate from source water(s) that might be used for potable supply with the following conditions:

1. The system is operated in a manner that minimizes changes in production flow rates (e.g., a plant operated 24 hours a day, 7 days a week, 365 days a year to provide a minimum production of water (base loading)).
2. If variability in flow and composition for extended periods of time cannot be controlled and minimized, then product water should be stored to allow analysis before releasing the water to the distribution system. *Storage vs Online System*
3. Site-specific tests are required to determine the impact of seasonal and temporal variations in water quality (temperature, available micro and macro nutrients, etc.) on process performance. For example, it is anticipated the exogenous carbon requirement will vary as a function of source water quality, so the impact(s) of variable nitrate concentrations (in time and magnitude) on finished water quality needs to be evaluated.
4. Source of the microbiological seed must be identified and characterized as not containing human pathogens.
5. All chemicals used in the system must be NSF standard 60 certified by an ANSI accredited laboratory.
6. It is recommended that all components used in the manufacture of the reactor vessel that come into direct contact with the source water be NSF standard 61 certified by an ANSI accredited laboratory.
7. It is also recommended that development continue on a reliable ethanol control system that would allow feed-forward control of the ethanol dose based on measured changes in composition and flow.
8. Treatment following biological perchlorate removal, at a minimum, should meet the pertinent requirements of the Surface Water Treatment Rule (Title 22 of the California Code of Regulations, Div. 4, Chapter 17).
9. On-line monitoring systems for perchlorate and nitrate should be incorporated into process design for improving process control.
10. When appropriate, additional organics removal (e.g., advanced oxidation (UV/H<sub>2</sub>O<sub>2</sub>) and/or granular activated carbon) can be added at an appropriate location downstream of the FBR as an independent unit treatment process.

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11. The WTC extends the conditional acceptance to include the Envirogen fluidized bed reactor (FBR) designed, built, and operated identically to the FBR described in the previously cited reports.

Any modifications proposed to any feature, chemical, part, or product used in this demonstration study of the biological treatment system should be reported (in writing) to the Department in advance of making the changes to any production version of the system sold in California. The detail of your written notification will be reviewed to determine if additional performance testing will be required. The written notice should provide sufficient detail (negative and positive results) to allow the reviewing body to decide whether or not additional studies will be required.

Should additional testing be required, the WTC must review and accept all study protocols before accepting the final report documenting the results of the additional testing. The WTC will also review the final report and, if appropriate, accept and modify any future changes to the design criteria.

Review and formal approval for any proposed design using this technology for individual water systems will be handled on a case-by-case basis by the Drinking Water Program's individual District offices. The individual district offices based on specific site requirements may specify additional unit treatment processes. Approval for the use of your technology in any drinking water application is granted through the domestic water supply permitting process.

An operations plan that includes a protocol for shutdown and cleaning of the FBRs will need to be submitted as part of the drinking water permit application process. Such a protocol should provide documentation (evidence) that the proposed procedure results in the removal of all cleaning chemicals from the FBR and its components before the unit is reassembled or otherwise prepared to return to production.

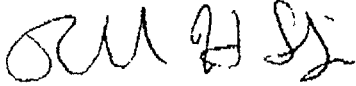
You are also requested to notify the Department of any changes in the tradename, ownership, or licensing activities of the conditionally accepted FBR. Furthermore, this letter and the conditions of acceptance for the FBR cannot be transferred until the Department receives written notification of any of these activities.

We would like to thank you and your colleagues for working with us during the development and testing of this technology. Having access to your expert panel for discussions during the testing of this technology was also beneficial to improving our

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understanding of the intricacies of this technology. Should you have any questions regarding the content of this letter, please free to contact me at (510) 849-5050.

Very truly yours,



Richard H. Sakajl, PhD, PE  
Senior Sanitary Engineer

cc: WT Committee  
chron

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